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VII. *An Account of a bituminous Lake or Plain in the Island of Trinidad. By Mr. Alexander Anderson; communicated by Sir Joseph Banks, Bart. P. R. S.*

Read February 19, 1789.

A MOST remarkable production of nature in the island of Trinidad, is a bituminous lake, or rather plain, known by the name of Tar Lake; by the French called La Bray, from the resemblance to, and answering the intention of, ship pitch. It lies in the leeward side of the island, about half-way from the Bocas to the south end, where the Mangrove swamps are interrupted by the sand-banks and hills; and on a point of land which extends into the sea about two miles, exactly opposite to the high mountains of Paria, on the north side of the Gulf.

This cape, or head-land, is about fifty feet above the level of the sea, and is the greatest elevation of land on this side of the island. From the sea it appears a mass of black vitrified rocks; but, on a close examination, it is found a composition of bituminous scoræ, vitrified sand, and earth, cemented together; in some parts beds of cinders only are found. In approaching this Cape, there is a strong sulphureous smell, sometimes disagreeable. This smell is prevalent in many parts of the ground to the distance of eight or ten miles from it.

This point of land is about two miles broad, and on the east and west sides, from the distance of about half a mile

from the sea, falls with a gentle declivity to it, and is joined to the main land on the south by the continuation of the Mangrove swamps; so that the bituminous plain is on the highest part of it, and only separated from the sea by a margin of wood which surrounds it, and prevents a distant prospect of it. Its situation is similar to a Savannah, and, like them, it is not seen till treading upon its verge. Its colour, and even surface, present at first the aspect of a lake of water; but I imagine it got the appellation of Lake when seen in the hot and dry weather, at which time its surface to the depth of an inch is liquid, and then from its cohesive quality it cannot be walked upon.

It is of a circular form, and I suppose about three miles in circumference. At my first approach it appeared a plane, as smooth as glass, excepting some small clumps of shrubs and dwarf-trees that had taken possession of some spots of it; but when I had proceeded some yards on it, I found it divided into areolæ of different sizes and shapes: the chasms or divisions anastomosed through every part of it; the surface of the areolæ perfectly horizontal and smooth; the margins undulated, each undulation enlarged to the bottom till they join the opposite. On the surface the margin or first undulation is distant from the opposite from four to six feet, and the same depth before they coalesce; but where the angles of the areolæ oppose, the chasms or ramifications are wider and deeper. When I was at it, all these chasms were full of water, the whole forming one true horizontal plane, which rendered my investigation of it difficult and tedious, being necessitated to plunge into the water a great depth in passing from one areola to another. The truest idea that can be formed of its surface will be from the areolæ and their ramifications on the back of

a turtle. Its more common consistence and appearance is that of pit-coal, the colour rather greyer. It breaks into small fragments, of a cellular appearance and glossy, with a number of minute and shining particles interspersed through its substance; it is very friable, and, when liquid, is of a jet black colour. Some parts of the surface are covered with a thin and brittle scoria, a little elevated.

As to its depth, I can form no idea of it; for in no part could I find a substratum of any other substance; in some parts I found calcined earth mixed with it.

Although I smelt sulphur very strong on passing over many parts of it, I could discover no appearance of it, or any rent or crack through which the steams might issue; probably it was from some parts of the adjacent woods: for although sulphur is the basis of this bituminous matter, yet the smells are very different, and easily distinguished, for its smell comes the nearest to that of pitch of any thing I know. I could make no impression on its surface without an axe: at the depth of a foot I found it a little softer, with an oily appearance, in small cells. A little of it held to a burning candle makes a hissing or cracking noise like nitre, emitting small sparks with a vivid flame, which extinguishes the moment the candle is removed. A piece put in the fire will boil up a long time without suffering much diminution: after a long time's severe heat, the surface will burn and form a thin scoria, under which the rest remains liquid. Heat seems not to render it fluid, or occupy a larger space than when cold; from which, I imagine, there is but little alteration on it during the dry months, as the solar rays cannot exert their force above an inch below the surface. I was told by one Frenchman, that in the dry season the whole was an uniform smooth mass; and by another, that the ravins

contained water fit for use during the year; but neither can I believe: for if, according to the first assertion, it was an homogeneous mass, something more than an external cause must affect it, to give it the present appearances: nor without some hidden cause can the second be granted. Although the bottoms of these ramified channels admit not of absorption, yet from their open exposure, and the black surface of the circumjacent parts, evaporation must go on amazing quick, and a short time of dry weather must soon empty them; nor from the situation and structure of the place is there a possibility of supply but from the clouds. To shew that the progress of evaporation is inconceivably quick here, at the time I visited it, there were, on an average, two-thirds of the time incessant torrents of rain; but from the afternoon being dry, with a gentle breeze (as is generally the case during the rainy season in this island), there evidently was an equilibrium between the rain and the evaporation; for in the course of three days I saw it twice, and perceived no alteration on the height of the water, nor any outlet for it but by evaporation.

I take this bituminous substance to be the *bitumen asphaltum* LINNÆI. A gentle heat renders it ductile; hence, mixed with a little grease or common pitch, it is much used for the bottoms of ships, and for which intention it is collected by many, and I should conceive it a preservative against the Borer, so destructive to ships in this part of the world.

Besides this place, where it is found in this solid state, it is found liquid in many parts of the woods; and at the distance of twenty miles from this about two inches thick, round holes of three or four inches diameter, and often at cracks or rents. This is constantly liquid, and smells stronger of tar than when indurated,

indurated, and adheres strongly to any thing it touches; grease is the only thing that will divest the hands of it.

The soil in general, for some distance round La Bray, is cinders and burnt earths; and where not so, it is a strong argillaceous soil; the whole exceedingly fertile, which is always the case where there are any sulphureous particles in it. Every part of the country, to the distance of thirty miles round, has every appearance of being formed by convulsions of nature from subterraneous fires. In several parts of the woods are hot springs; some I tried, with a well graduated thermometer of FAHRENHEIT, were 20° and 22° hotter than the atmosphere at the time of trial. From its position to them, this part of the island has certainly experienced the effects of the volcanic eruptions, which have heaped up those prodigious masses of mountains that terminate the province of Paria on the north; and no doubt there has been, and still probably is, a communication between them. One of these mountains opposite to La Bray in Trinidad, about thirty miles distant, has every appearance of a volcanic mountain: however, the volcanic efforts have been very weak here, as no trace of them extend above two miles from the sea in this part of the island, and the greater part of it has had its origin from a very different cause to that of volcanos; but they have certainly laid the foundation of it, as is evident from the high ridge of mountains which surrounds its windward side to protect it from the depredations of the ocean, and is its only barrier against that over-powering element, and may properly be called the skeleton of the island.

From every examination I have made, I find the whole island formed of an argillaceous earth, either in its primitive state, or under its different metamorphoses. The bases of the
mountains

mountains are composed of *schistus argillaceus* and *talcum lithomargo*; but the plains or low lands remaining nearly in the same moist state as at its formation, the component particles have not experienced the vicissitudes of nature so much as the more elevated parts, consequently retain more of their primitive forms and properties. As argillaceous earth is formed from the sediment of the Ocean, from the situation of Trinidad to the Continent, its formation is easily accounted for, granting first the formation of the ridge of mountains that bound its windward side, and the high mountains on the Continent that nearly join it: for the great influx of currents into the Gulf of Paria from the coasts of Brazil and Andalusia must bring a vast quantity of light earthy particles from the mouths of the numerous large rivers which traverse these parts of the Continent; but the currents being repelled by these ridges of mountains, eddies and smooth water will be produced where they meet and oppose, and therefore the earthy particles would subside, and form banks of mud, and by fresh accumulations added would soon form dry land; and from these causes it is evident such a tract of country as Trinidad must be formed. But these causes still exist, and the effect from them is evident; for the island is daily growing on the leeward side, as may be seen from the mud-beds that extend a great way into the Gulf, and there constantly increase. But from the great influx from the Ocean at the south end of the island, and its egress to the Atlantic again, through the Bocas, a channel must ever exist between the Continent and Trinidad.

